REMARKS

This amendment is submitted in response to the non-final Office Action mailed on July 7, 2005. Claims 1-14 are pending in this application. Claims 8-11 are canceled. In the Office Action, Claims 1-7 and 12-14 are rejected under 35 U.S.C. §112, first paragraph and Claims 1-7 and 12-14 are rejected under 35 U.S.C. §101. In response Claim 1 has been amended. This amendment does not add new matter. In view of the amendments and/or for the response set forth below, Applicants respectfully submit that the rejections should be withdrawn.

In the Office Action, Claims 1-7 and 12-14 are rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. The Patent Office alleges that the claims contain subject matter that was not described in the specification in such a way as to enable one skilled in the art to which it pertains to make and use the invention. Specifically, the Patent Office alleges that the specification fails to teach a transformed plant with reduced galactoside activity, increased galactose branching and increased solubility of coffee.

Applicants respectfully disagree and submit that one having ordinary skill in the art would be able to make/use the present claims based on Applicants' specification without undue experimentation. The specification provides adequate guidance to one of ordinary skill in the art on how to make and use the present claims for a transformed plant with reduced endogenous α-D-galactosidase activity and increased galactose branching resulting in increased solubility of coffee with routine experimentation as understood by one having ordinary skill in the art.

Applicants have amended Claim 1 to recite, in part, a coffee plant cell that produces galacto-mannans and that is modified to reduce endogenous levels of α-D-galactosidase activity in order to increase galactose branching of the galacto-mannans, wherein the coffee plant cell is produced using antisense technology. This amendment is supported in the specification, for example, at page 3, lines 10-31. As a result, the coffee plant cell modification results from using antisense technology as discussed by the specification.

In the as-filed specification, it was found that the antisense construct was at least expressed confirming the presence of the α-galactosidase antisense mRNA in coffee embryos derived from transformed plants. See, specification, page 12, lines 16-27. However, recent data for grain (beans) from the transformed plants indicates that the targeted α-galactosidase gene does have reduced expression in transformed plants.

Applicants note that compliance with the enablement requirement of 35 U.S.C. §112, first paragraph, does not turn on whether an example is disclosed. See MPEP 2164.02. An example may be "working" or "prophetic." A working example is based on work actually performed. A prophetic example describes an embodiment of the invention based on predicted results rather than work actually conducted or results actually achieved. *Id.* Accordingly, an applicant need not have actually reduced the invention to practice prior to filing. The specification need not contain an example if the invention is otherwise disclosed in such manner that one skilled in the art will be able to practice it without an undue amount of experimentation. *In re Borkowski*, 422 F.2d 904, 908, 164 USPQ 642, 645 (CCPA 1970).

Applicants respectfully disagree with the Patent Office's assertion that undue experimentation is necessary to arrive at the present claims. In fact, the reduction of α-D-galactosidase activity may be achieved by known antisense methods. For example, such a reduced endogenous level of α-D-galactosidase activity is obtained by introducing a construct into a coffee plant cell, containing a nucleic acid that is transcribed into an antisense copy of the mRNA encoded by the α-D-galactosidase gene, or to a part thereof.

To this end, the antisense copy of the mRNA encoded by the α-D-galactosidase gene may be any ribonucleic acid capable of forming dimers under physiological conditions, i.e., to hybridize with the mRNA encoded by the α-D-galactosidase gene under conditions prevailing in the cell. Thus, the antisense copy does not need to be a 100% homologue to the corresponding counterpart, but rather needs to provide sufficient binding for forming a dimer. Consequently, antisense copies (and the corresponding nucleic acids from which they are transcribed), that are modified by substitution, deletion and/or insertion of nucleotides are well within the context of the present invention. In this respect, it will also be appreciated that the antisense copy may represent a full counterpart to the mRNA encoded by the α-D-galactosidase gene, that is, it may provide a RNA molecule having essentially the same length as the mRNA encoding the α-D-galactosidase polypeptide. On the other hand the antisense copy may only cover a part of the mRNA encoding the α-D-galactosidase polypeptide.

Antisense is a widely used technique in plants. When the technique is used, a few different types of constructs can be generated and tested together. Typically, one does not make one antisense construct and expect it to work. Even using the same sequence with the same

plasmid may not achieve the same results if the transformation is done differently. Overall, this technique has some intrinsic measure of experimentation. Even in expert hands with a known sequence, the results are variable and need replication. In a majority of cases, 2-4 constructs are made and tested. This does not constitute trial and error in the art of antisense, but is routine to one having ordinary skill in the art.

In most cases the full cDNA sequence in antisense orientation will work. It is just a matter of experimental optimization as discussed previously to achieve reduced gene expression. Further, as one having ordinary skill in the art understands, small parts of the cDNA will almost surely work.

Indeed, the present claims are within the capabilities of one having ordinary skill in the relevant art. Barring a currently unanticipated reason, the antisense sequence and the construct described in the specification should work to reduce the expression of this gene in the coffee grain as the whole gene sequence is used. Further, evidence in the specification indicates the construct working properly, and Applicants' recent experimental evidence with beans confirms it is working as expected thereby providing a reasonable expectation of success.

Regarding the Patent Office's "speculation" assertion about the correlation between the reduction of endogenous levels of α-D-galactosidase activity and the increased level of galactose units on the mannan chain (see, Office Action, page 6), Applicants respectfully submit that previous research has provided evidence for this correlation as discussed in the specification. For example, in some plants, the degree of galactose branching on the mannan chains has been found to partially depend on the activity of the α-D-galactosidase (EC 3.2.1.22). This enzyme is capable of releasing α-1,6-linked galactose units from galactomannans stored in plant seed storage tissue or maturation (Buckeridge and Dietrich, Plant Sci. 117 (1996), 33-43). In addition, the accumulation of galactomannans having a very low galactose/mannose ratio in some plant endosperms or cotyledon tissues has been shown to correlate to peak α-D-galactosidase activity during maturation of these tissues and to the hardening and drying thereof (Kontos and Spyropoulos, Plant Physiol. Biochem. 34 (1996), 787-793). α-D-galatosidases activity has also been associated with the capacity to remove galactose residues, i.e., α-1,6-linked to galactomannan polysaccharides, which brings about a decreased solubility of these polymers (McCleary, Carb. Res. 92 (1981), 269-285). Furthermore, the removal of galactose side chains

from galactomannans seems to increase the capacity thereof to interact with other polysaccharides, e.g., xanthans in guar, with a concomitant formation of complex gel. Galactose branching on coffee grain mannans decreases from approximately 40% in young grains to the low level found in the mature grains during maturation. Concurrently, α-D-galactosidase enzyme activity increases during coffee grain maturation.

In the Office Action, Claims 1-7 and 12-14 are rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. Specifically, the Patent Office alleges that the claims contain subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The Patent Office alleges that there is a lack of written description by the specification regarding the coffee plant cell, the coffee plant, and the coffee beans as well as the structure of the nucleic acid (mRNA) or parts thereof, derived from the α-D-galactosidase gene of the cell, contained in the coffee plant cell, coffee plant and coffee beans.

Applicants respectfully disagree and submit that the test for sufficiency of support is whether the description allows person of ordinary skill in the art to recognize that he or she invented what is claimed. As discussed previously, the specification provides adequate guidance to one of ordinary skill in the art on how to make and use the present claims for modification of the coffee plant cell so as to reduce α-D-galactosidase activity using antisense oligonucleotides, thereby producing increased galactose branching of galactomannans and increased water solubility. Moreover, one having ordinary skill in the art can use the alpha gal sequence provided by the Applicants to make an antisense construct that is capable of reducing the level of α-D-galactosidase activity in a transformed plant, either in the whole plant by using a ubiquitously expressed 35S promoter to drive the alpha gal antisense gene, or, in the endosperm of the coffee grain (grain specific reduction of expression), by using an 11S promoter as described in the specification.

Further, if the endogenous levels of α-D-galactosidase activity was reduced, it is possible that the level of galactose units on the mannan chain could be increased (as shown by prior research) and this could increase solubility and extractability. For example, as stated in the specification, in coffee grains, cell wall polysaccharides account for approximately 48% of

mature coffee bean dry weight, and of these, mannans represent approximately half. These polysaccharides are essentially insoluble in purified form and have very low galactose branching (Bradbury and Haliday, J. agric. Food Chem. 38 (1990), 389-392). Mannan polymers are acknowledged to be the main reason for the large losses of original green coffee weight encountered during preparation of soluble coffee drinks. The losses occur either when insoluble material remains as sediments during initial extraction or when precipitates and gels form during storage of coffee liquors. Mannans have also been shown to be the principal component responsible for cloudiness and precipitation during standing of coffee beverages. In view of this, even a small relatively effective antisense nucleic acid could be sufficient to give a commercially relevant result in accordance with the present claims.

Based on at least these noted reasons, Applicants believe that Claims 1-7 and 12-14 fully comply with 35 U.S.C. §112, first paragraph. Accordingly, Applicants respectfully request that the rejection of Claims 1-7 and 12-14 under 35 U.S.C. §112, first paragraph, be withdrawn.

In the Office Action, Claims 1-7 and 12-14 are rejected under 35 U.S.C. §101 as allegedly being directed to non-statutory subject matter. Specifically, the Patent Office alleges that the claimed invention is directed to non-statutory subject matter. In response, Claim 1 has been amended to recite, in part, that the coffee plant cell is produced using antisense technology. As a result, the present claims are distinguished from naturally-occurring wild-type plants.

Based on at least these noted reasons, Applicants believe that Claims 1-7 and 12-14 fully comply with 35 U.S.C. §101. Accordingly, Applicants respectfully request that the rejection of Claims 1-7 and 12-14 under 35 U.S.C. §101 be withdrawn.

For the foregoing reasons, Applicants respectfully request reconsideration of the above-identified patent application and earnestly solicit an early allowance of same.

Respectfully submitted,

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